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PRINCIPAL INVESTIGATOR: Ann C. Klassen, Ph.D.

CONTRACTING ORGANIZATION: Johns Hopkins University
School of Public Health
Baltimore, Maryland 21205-1996

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FOREWORD

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Ann C Klassen, PhD 8/3/99
PI - Signature Date

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INTRODUCTION

The purpose of the Minority Population Focussed Training Program was to prepare the trainee to conduct research in the area of excess burden of prostate cancer among African American men, with excess burden defined as greater incidence, later stage at diagnosis, less access to state of the art treatment, or excess mortality from the disease. The goals were to examine results from previous research, and to develop new research. Refining measures of prostate cancer burden was a special focus of this work.

During the six month project, the trainee reviewed 120 studies and task force reports on prostate cancer. Three sources of data on prostate cancer were obtained for analyses: the SEER Cancer Incidence data, the State of Maryland Cancer Registry data, and zipcode-specific rates for Baltimore City.

The major findings focussed on the wide variation in prostate cancer burden among African Americans, and the need to analyze cancer patterns by combining data from a variety of sources. One unanswered question from existing research is the extent to which socioeconomic disadvantage can explain some of these racial differences in cancer burden. The need for geographically based analyses led the trainee to develop and submit proposals for larger scale projects examining prostate burden among Maryland men, using GIS techniques to link Registry data with environmental, social and health care data.

BODY

PLAN OF WORK

The following Tasks represent the Statement of Work as approved in final form for the Minority Population Focussed Training Award for Dr. Klassen.

Phase 1. Project Start-Up and Definition of Scope (Month 1)

- Meet with mentor(s) to define scope of problem
- Conduct informational interviews with other prostate cancer clinicians and researchers
- Conduct extensive literature review on topics and areas identified
- Identify sources of publicly available prostate cancer data (SEER, etc)

Phase 2. Review of Existing Studies: Data Analysis and Interpretation (Months 2-5)

- Contact identified researchers, and obtain materials (questionnaires, health promotion materials, reports) from existing studies of older African American men and prostate cancer
- Request epidemiologic prostate cancer data identified, negotiate analyses
- Build database of data obtained
- Summarize findings from review, and identify areas of research need

Meet again with mentor(s)

Phase 3. Synthesis of Results, and Development of Research Proposal (Month 6)

Use results to develop protocol for research proposal

Review protocol with mentor(s) and other experts as indicated

Submit final report

Develop presentation and publication from preliminary research results

Overall, the conduct of the training program followed the proposed Statement of Work. Dr. Klassen utilized a wider range of prostate cancer experts, because the nature of the research problem. Specifically, Dr. Klassen was able to consult with epidemiologists, clinicians, and cancer control professionals, including the Director of the Maryland Cancer Registry.

The following sections of the report summarize the key findings of the training activities, and define the large scale research proposal that Dr. Klassen has successfully developed and submitted for funding during the training period.

KEY FINDINGS

1. Overview of Prostate Cancer: Review of Existing Research

The burden of prostate cancer is significant in the United States, and represents the most common cancer diagnosis for American men (Miller). The incidence of this disease continues to increase, in part due to the general aging of the society. Mortality from prostate cancer is significantly lower than incidence, and as with many diseases prevalent in the elderly, more men "die with prostate cancer than from it". However, this truism ignores the significant mortality caused by prostate cancer; about 30% of cases, or close to 40,000 men in the United States die from prostate cancer annually .

For many reasons, this disease presents complex cancer control issues. The causes of prostate cancer remain unclear, and little advice can be offered to men as to avoiding primary risk for the disease. Familial risk explains less than 10% of cases, and even in families, the causal pathway of genetic versus behavioral and environmental influences is unclear.

Secondary prevention strategies are complicated by lack of clear evidence about the benefits of screening and early detection. For all diseases, routine screening improves survival when early detection and treatment is consistently associated with reduced mortality compared to later detection. Although treatment of localized prostate cancer is generally more successful than advanced disease, many men are found to have prostate cancer relatively late in life, and the burden of aggressive treatment may outweigh survival advantage if the cancer remains slow growing. Conversely, aggressive cancer, especially in younger men, may proceed too rapidly for large scale annual screening to conclusively improve outcomes.

Despite these issues, there is growing recognition that for groups with high rates of cancer, it is an important public health strategy to raise awareness of the disease, and introduce discussions of screening and disease recognition between men and their health care providers. High risk groups, such as African American men, or men with significant family histories of prostate cancer, could especially benefit from education and informed decision making regarding screening.

From a population perspective, determining exactly who is at increased risk for death from prostate cancer and why remains elusive. Studies of prostate cancer incidence in the United States and worldwide show clearly that prostate cancer is far more prevalent, and claims more lives, in some cultures and ethnic groups than others. African American men have the highest rate of prostate cancer in the world, while certain Asian cultures have the lowest. Urban men have been shown in some studies to have higher rates of prostate cancer than those living in rural areas.

Many factors have been shown in the descriptive epidemiology to be associated with greater risk for prostate cancer (Bosland). Dietary risk factors include fats, while suspected protective elements range from vitamins and micro nutrients to soy. History of sexually transmitted diseases has been linked to higher rates of prostate cancer. Certain non-industrial occupations, including ranch, poultry and farming work, have been linked in population studies to increased risk. For industrial workers, rubber, iron and steel work have all been linked to greater risk. Finally, exposure to air pollution has been associated with prostate cancer.

Many of these results come from studies limited to one geographic area or racial group. Other of these factors, such as the urban/rural difference, seem more significant for one racial group than another.

From the epidemiological data, it is clear that in the United States African American men bear a significant burden of excess incidence, late stage diagnosis, and mortality from this disease. Although it is hypothesized that socioeconomic influences may lie behind much of this racial burden, the theoretical pathways for these influences in the specific disease etiology and progression of prostate cancer remain poorly described.

Socioeconomic resources may influence any of the above mentioned primary risk factors for prostate cancer. Economic resources may shape a person's diet, urban or rural residence, occupation and level of environmental risk within occupation. It may influence exposure to, and the successful treatment of diseases such as STDs. It may also determine, within a community or city, whether or not one lives near or is exposed to environmental hazards such as toxic waste or incineration. All of these influences may explain why, in the aggregate, African Americans in the United States have elevated rates of prostate cancer incidence.

Social and cultural influences may also have a role in determining the secondary and tertiary prevention of prostate cancer, and therefore the African American burden from excess

mortality. These racial differences may have their root in lack of access to screening itself, or failure to receive recommendations and health education about screening. There is also compelling evidence from a variety of studies indicating that African Americans and low income persons are less likely to receive state of the art treatments for many types of disease, even when diagnosed. Therefore, it is plausible that the consequences of prostate cancer diagnosis at any stage are more severe for African Americans than others, and may ultimately lead to higher rates of death at each stage of the disease.

There is some evidence that social and economic influences may lie behind the excess prostate cancer burden for black Americans. Researchers have used a variety of populations and measures to examine the contribution of social factors on black-white differences in prostate cancer incidence, stage at diagnosis and survival/mortality rates. The following table summarizes some of the findings.

<u>Author</u>	<u>Outcome</u>	<u>Area(s)</u>	<u>Intervening Factors</u>	<u>Unit of Measure</u>	<u>Results</u>
Baquet	Incidence	SEER 3 Cities	Median Education Median Income	Census Tract	No SES Effect Race Effect Remains
McWhorter	Incidence	SEER 9 Sites	Median Inc/Poverty Education	Census Tract	SES Effect Race Effect Remains
Ernster	Incidence Mortality	Alameda Co California	% College	Census Tract	SES does not change Racial Difference
Liff	Stage at dx	Georgia	Urban/Rural	Individual	Rural=late/unstaged, worse for blacks
Ndubuisi	Stage at dx	Wash, DC	H.S. Educ, Inc, Home Ownership	Census Tract	SES Effect Race Effect Remains
Polednak	Stage at dx	Connecticut	% Below Poverty	Census Tract	SES Effect Race Effect Remains
Dayal	Mortality	11 Centers (National)	% HS grad	Zipcode	SES Effect Race Effect Remains
Optenberg	Survival	National	Access to Care: All pts receive Dept of Defense Med Care Benefits and Treatment		No Racial Differences

These results show that persistent racial differences exist in population-based studies of prostate cancer, except when extremely homogeneous groups are studied, such as patients in the same health care system who also share similar occupational histories.

However, most of these studies also show that, even when only a limited measure of social resources is used, social disadvantage explains at least some of the variation in prostate cancer outcomes. These patterns call for more in-depth examination of the role of race and social resources in this disease.

2. Need for Social-Geographic Interpretations of Prostate Cancer

Descriptive epidemiology of the incidence and mortality from this disease is crucial to shedding light on its etiology. If social factors have an important role in prostate cancer, then the groups most effected can be targeted for increased surveillance and education, even if the root causes of disadvantage cannot be changed as quickly.

Unfortunately, as the above table shows, often when environmental measures are included in theoretical models, they are limited to census data, and to simply attaching neighborhood attributes to individual records as additional data elements. In addition to problems of statistical correlation and interpretation of relationships (Geronimus 1998), this approach accepts a priori that the geographic influence of neighborhood characteristics follows the shape of census blocks or tracts (Rushton). However, it is unlikely that if, for example, environmental exposures influence prostate cancer, these influences would stop at the edge of a census tract.

Computer technology has opened new opportunities for the synthesis of many types of sociodemographic and health information. The emerging technology of computer-aided geographic data analysis, commonly described as Geographic Information Systems (GIS) (Ricketts), can strongly complement individual-level data in health research.

GIS methods have been in development for over 20 years, but are now becoming widely available and accessible to the general research community . A wide variety of software programs are marketed for medical geography research, and many of these programs have been created for use without extensive computer hardware investments by researchers. For example, many can be used on newer and more powerful personal computers. The most extensive use of GIS methods to date in public health has been in the area of geographic exposures to contagious diseases and environmental risks. There are also examples of medical geography applications to access to care and other health services research questions .

When addressing community-level health service and health needs, public health researchers and planners are now potentially able to integrate information from a variety of sources: the census, cancer registries and other disease-specific data, local municipal information such as bus and transportation routes, block-specific rates of crime, home ownership and vacancy, and other "quality-of-life" indicators.

The unique and innovative potential of these research methods, when taken as a whole, lies in the ability to combine geographic data from a wide range of sources. This synthesis of

data allows for the development of new explanatory models of the mechanisms of interaction between larger sociological conditions, such as poverty and environments of disadvantage, and personal and family characteristics such as occupation, race or age. Both levels of variables have been identified as important influences in health promotion and disease prevention, but they are rarely studied simultaneously in an in-depth way.

3. Prostate Cancer in Maryland: Preliminary Data Analyses

Preliminary information from the Maryland Cancer Registry and the Center for Disease Control (CDC) Mortality database show patterns of prostate cancer incidence, stage at diagnosis, and mortality in Maryland which vary significantly by region and race. (Available preliminary data presented in Tables 1 and 2 here from the Maryland Cancer Registry combines all nonwhite ethnic groups together, while CDC mortality data in Table 3 include only African Americans. The great majority of non white residents of Maryland are in fact African American; however, in all proposed analyses for this study each non white ethnic group will be considered separately.)

Table 1 (below) describes the age-adjusted incidence of prostate cancer in 1996 for whites and non-whites in five regions of the State, and the State as a whole. We see that, although non-whites have a consistently higher incidence of prostate cancer than whites in every area of Maryland, there are substantial differences by area. The two predominantly urban areas of the State, the Baltimore and Washington DC areas, have higher incidence than the rural areas of the State for all ethnic groups, although the difference is greater for non whites than whites. The two counties closest to Washington, DC (Prince Georges and Montgomery County) have substantially wealthier African American populations than the rural areas of the State such as the Eastern Shore, yet the incidence of prostate cancer among African Americans is highest in these counties. These patterns indicate the need for geographic analyses which are more sensitive to small area variation and patterns.

**Table 1. Age Adjusted Prostate Cancer Incidence
By Race and Geographic Region: Maryland 1996**

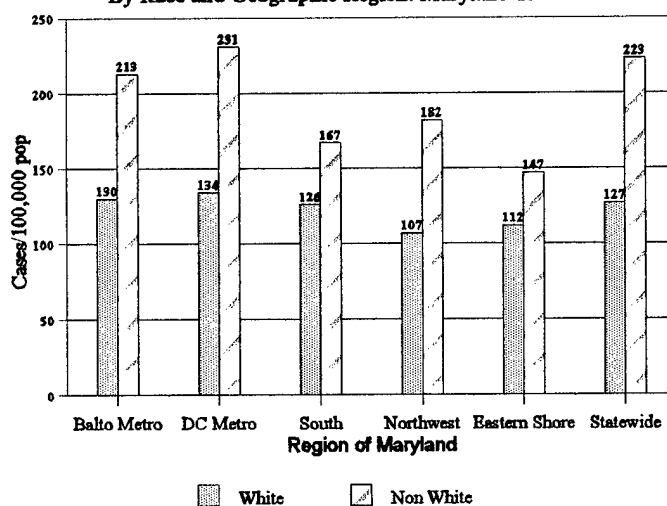
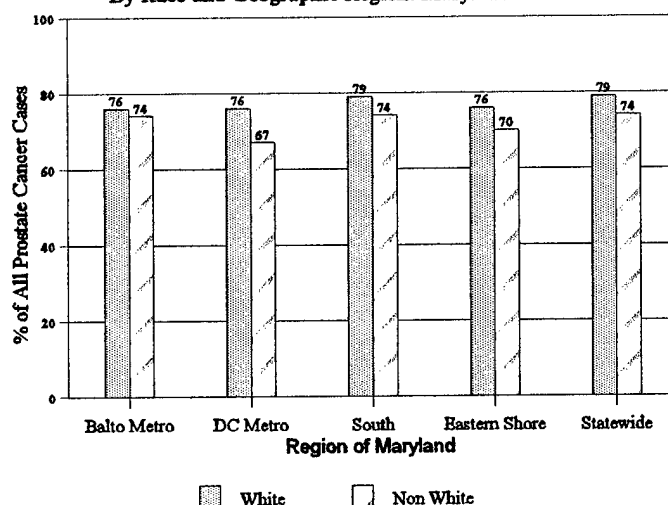


Table 2 offers additional information on the burden of late detection of prostate cancer by ethnic group and area of the State, which may play a role in mortality from this disease. Overall in the State, the majority of cases are detected at a local stage, although non white patients are less likely to have their prostate cancer detected at the local stage than whites (74% vs. 79%). There is some geographic variation in these patterns, with DC area non whites least likely to receive the benefit of early detection (67%). These patterns raise significant questions, as the DC area counties offer greater health care resources to African Americans than many rural areas of the Eastern Shore, yet their proportion of late stage disease is higher. (Northwest Maryland is not reported here, because of the small number of nonwhite cases.)

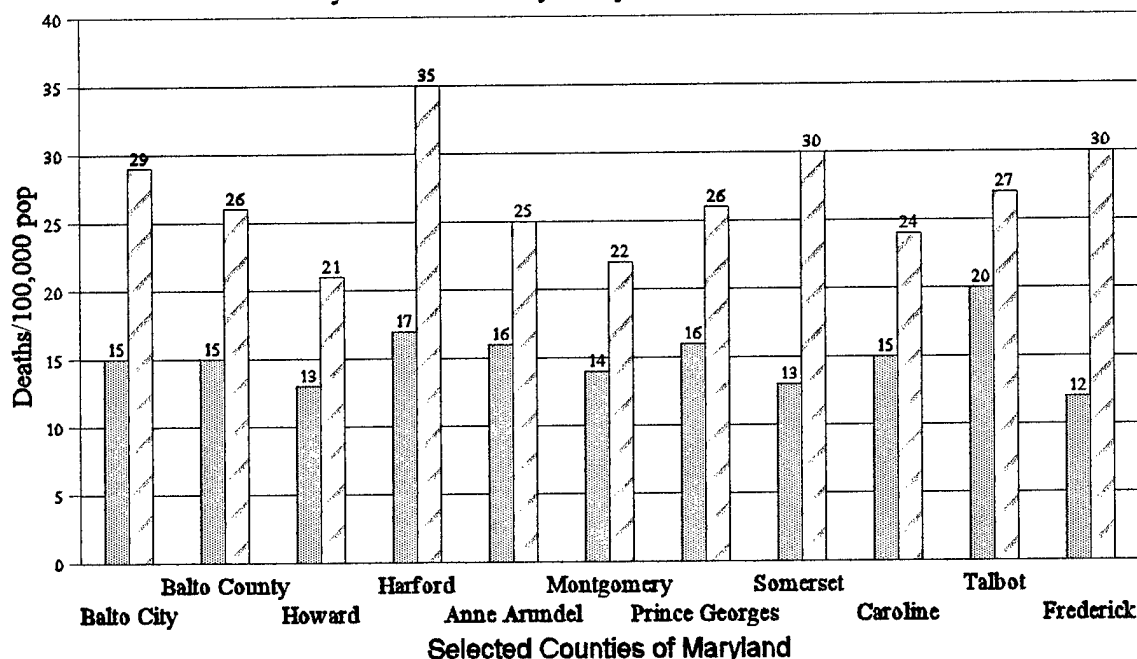
**Table 2. Percent of Cases Diagnosed at Local Stage
By Race and Geographic Region: Maryland 1996**



Finally, we have looked at prostate cancer mortality rates in the State. We combined data across a 17 year period, in order to gain sufficient numbers for county-level and race-specific age-adjusted rates, which were reliable.

The data in Table 3 indicate that regional interpretations such as those used in Tables 1 and 2 may mask considerable variation in county-specific rates of prostate cancer by race. Baltimore, Harford, Howard and Anne Arundel counties, for example, are all contained in the previous Baltimore metropolitan rates, and all contain both rural and urban areas. However, Harford County's rate of prostate cancer death for African Americans across a 17 year window is almost double that of Howard County. These county-specific data contradict the conclusion which might have been drawn from Table 1, of increased cancer burden in urban areas.

Table 3: Age Adjusted Prostate Cancer Mortality
By Race and County: Maryland 1979-1996



Similarly, when looking at Somerset, Talbot, and Caroline Counties, three of the nine counties which are included in the Eastern Shore data in previous tables, we see that there is significant variation in death rates for both whites and African Americans. The Eastern Shore of Maryland represents a potentially important area for this research, because it comprises significant areas of agricultural and poultry industry exposures for men of both races, as well as significant areas of rural low income African American population. This allows for comparisons with low income urban African Americans.

PLAN FOR FUTURE WORK

The purpose of the Minority Population Focussed Training Program was to prepare researchers for conducting research in the area of prostate cancer and minority health. Based on the results of the preliminary investigations described above, Dr. Klassen has developed and submitted a proposal for research using the Maryland Cancer Registry data for GIS analyses of prostate cancer burden in Maryland. Described below are the research questions and methods for this planned research.

Hypothesis/Purpose

The proposed research will explore regional differences in prostate cancer incidence and disease burden

among ethnic groups of Maryland men. It will identify regional and local characteristics associated with greater disease burden for all men, and for specific subgroups such as ethnic or income groups.

The purpose of this research is to identify possible influences and pathways which may explain the wide variations in disease burden for African Americans and whites. Although the purpose of this research is to generate rather than test specific hypotheses, we hypothesize that geographic patterns of prostate cancer burden (defined as incidence, late stage diagnosis, and mortality) will vary in consistent and statistically significant ways, and that these differences will be consistently related to geographic and social characteristics of local areas and populations.

Objectives/Specific Aims

The specific aims of the proposed research are to conduct exploratory analyses of Maryland prostate cancer incidence and mortality by geographic and sociodemographic indicators, in order to identify patterns of disease burden meriting further study.

These exploratory analyses will yield information on attributes of high risk geographic areas for both African American and white prostate cancer cases, and serve to answer exploratory questions such as "What are the attributes of communities with high proportions of late stage diagnosis for African American men? Are these attributes similar for white men who are diagnosed at a late stage, or are there characteristics unique to excess racial burden for this disease?" This geographically descriptive, hypothesis-generating research will serve as a starting point for confirmatory individual-based research, such as case control studies of specific risk factors.

Methods

The research will be conducted in three distinct phases: 1) geographic analysis of Maryland Cancer Registry data, 2) analysis of geographic data added to Registry data, and 3) scientific interpretation and preparation of reports and manuscripts from the analysis.

Phase 1: Geographic Analyses of Maryland Cancer Registry Data

We have met with the Director of the Maryland Cancer Registry to discuss the time line and details of obtaining registry data. The Maryland Cancer Registry's data are monitored for quality control, and meet the CDC's national standards for cancer registry data. The Maryland Cancer Registry is committed to assisting researchers in using the data to its full extent, and therefore this project is well within its mission. The Maryland Cancer Registry has an Institutional Review Board, and consent for the research has been obtained.

There are approximately 3500 new cases of prostate cancer per year in Maryland. We will begin our exploratory analyses with data from both historic files of previous years, as well as current years as they become available over the course of the project. We will negotiate with the Cancer Registry for geocoding, the process of assigning specific map coordinates and locations to each case, by address.

Because geographic analyses are not restricted a priori to specific geographic groupings, there will not be issues of sample size with these analyses. With software such as SATScan (Kulldorf), we examine the patterns and distribution of cases across geographic areas, and identify the naturally occurring shape of areas with significantly different numbers of a given variable of interest. In densely populated areas, this may be a shape that is relatively small. We may find, for example, that significant numbers of cases occur in a single neighborhood in urban areas. However, in rural areas, there may be greater geographic size to areas of significance. This flexibility in interpretation is a strength of GIS. We will use ARCVIEW software for the majority of our mapping and interpretations.

Phase 2 Analyses: GIS analyses of Maryland Geographic Data

This second phase of analyses will utilize data from a variety of information databases to examine the relationship of these geographic characteristics to prostate cancer. The Principal Investigator will continue to extensively research the existing literature on GIS and health services research, and identify additional types of data relevant to these analyses. She will remain in contact with local and national sources of possible data. In consultation with other experienced data users, she will choose sources of data, and negotiate use.

For examples, we will identify sources of environmental data, including waste and incineration sites, industrial sites, farming, pesticide, poultry and other land uses possibly linked to prostate cancer. We will look at health services and access to care, and map variables relevant to prostate cancer screening, such as the location of urologist and screening services. Characteristics of health care providers located in specific areas are available from a wide range of sources: the State of Maryland medical boards, the American Medical Association databases, Medicare data, as well as the National Center for Health Statistics.

We will look at geographic patterns from existing individual-level survey data, such as the Behavioral Risk Factors Survey conducted by the Center for Disease Control. To the extent possible, we will attempt to look at the geographic distribution of self-reported practices such as receipt of digital rectal exam and PSA testing, as well as dietary information.

Using existing and additional data, we will build map layers for each area of the State. We will use ARCVIEW mapping software to integrate all geographic data obtained and chosen for analyses. This database will be used both graphically in map format for interpretation and data display, and as a set of coded quantitative values corresponding to the measures developed for analyses.

It is important to note that we will not be attributing specific exposures or experiences to the cases of prostate cancer themselves. Our analyses are therefore associative rather than causal in interpretation. If for example, we are able to examine the relationship between higher rates of prostate cancer, and areas where higher rates of sexually transmitted disease occurs, it would represent an ecologic fallacy to connect these events on an individual level. However, this geographic association is an important contribution.

Registry data does contain significant individual data, which will add to the geographic analyses. For example, occupational information from the registry, in combination with geographic data from the GIS, will allow us to examine geographic patterns of outcomes for high risk groups separately. We may find that, in rural areas, separate analyses for agricultural versus non agricultural workers are more informative than combined

analyses.

Phase 3 Analyses: Replication and Comparison of Findings with Other Data

In the third phase of the research, we will review study findings with colleagues who are active in prostate cancer control research. The goal of these discussions will be to compare our results with existing research in prostate cancer, and to identify both differences and similarities across groups in relationships between social factors and prostate-related health.

We will also identify hypotheses and areas of interest for more targeted research. Hypotheses developed in this research could be more rigorously tested in case-control studies, with more narrowly focussed research questions, data requirements and methods.

Finally, we will prepare a series of manuscripts based on the results of this study, and final reports to both the funder and the Maryland Cancer Registry and Cancer Control Council.

CONCLUSIONS

Through the mechanism of the Minority Population Focussed Training Program, the trainee has investigated the question of sociodemographic variation in African American prostate cancer burden, and has developed a proposal for further work in the area. She has developed scientific background and expertise in the area, as well as developed support and collaborative support necessary to conduct such research, including the endorsement of the Maryland Cancer Registry for her proposed analyses.

PERSONNEL SUPPORTED ON PROJECT:

As proposed in the initial budget, three individuals received direct salary support from the funding, and worked on the project in the following capacities:

PRINCIPAL INVESTIGATOR/TRAINEE:

Ann C. Klassen, Ph.D., Principal Investigator, is an Assistant Professor in the Faculty of Social and Behavioral Sciences, Department of Health Policy and Management, of the Johns Hopkins University School of Hygiene and Public Health, and holds a joint appointment in Oncology, Johns Hopkins School of Medicine. She assumed overall responsibility for the conduct of the research. She developed information collection and analysis plans with input from the other members of the study team. She directed the planning and preparation of all written reports and proposals for additional research from the project. These tasks required a 60% time commitment on Dr. Klassen's part throughout the six month project period.

PROJECT STAFF:

Ann L. Smith, M.H.S. was the Project Coordinator for this research. She assisted Dr. Klassen in identifying and obtaining the relevant data for the project, and in the interpretation and synthesis of results, and the preparation of reports and articles. Ms. Smith assisted Dr. Klassen in these aspects of the proposed research, for 50% effort during the six month period.

Tene Paul-McClelland, B.S. was the database manager and secretary for the project. In this capacity, she entered all data into, maintained, and created reports from all databases, and used multiple software packages (SPSSX-PC, Paradox, Excel) to link data for reports and other purposes. She assisted in the preparation and submission of all project-related reports and manuscripts, including the tables and data presentations. She spent 50% of her time on the project during the 6 month period.

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